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ABSTRACT

Pointing out the current need for emphasis on academic achievement and excellence, this paper discusses challenges faced by educators in seeking to make the best use of advanced technologies to prepare students for life in the information society. The three major goals of education are identified as preparing individuals with the computer skills needed for the job market, improving skill instruction, and increasing the productivity of teaching. It is noted that interest in using technology in schools at all levels is widespread, as evidenced by statistics on microcomputer acquisition and use, and special meetings to explore potential uses of technology. The importance of the computer as a tool for the improvement of instruction in the basics is discussed, and current programs in The Office of Educational Research and Improvement (OERI) are briefly described. These projects include the MATH/TECH program for seventh through twelfth grade classroom application; Project Quill, which uses the microcomputer to help teachers teach writing to third through sixth grade students; a series of school-based technology demonstration sites using technology in the fields of science, mathematics, reading, and writing; the use of educational television to teach science through programs such as the "Voyage of the Mimi" and "3-2-1 Contact"; and the establishment of a Center for Technology at Harvard University to focus on key issues in education and technology. (DJR)

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The Challenge of the Information Age--Forging the Frontiers of Excellence in Education

by
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Research and Improvement
U.S. Education Department

Keynote Address
"Computer Impact on Excellence in Education"
October 22, 1983
Bellflower, California

Conference hosted by Bellflower Unified School District, Los Angeles County Superintendent of Schools, the Long Beach and Fullerton Chapters of Phi Delta Kappa of California State University, U.S. Department of Education, Region IX in conjunction with the National Diffusion Network.

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Donald J. Senese

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Good Morning.

I wish to extend a warm and sincere welcome to each one of you from the United States Education Department and to express my sincere appreciation for the opportunity to keynote a conference with the challenging, even provocative, title of "Computer Impact on Excellence in Education." It is a pleasure to be in the great state of California and to join with the Bellflower Unified School District, Los Angeles County Superintendent of Schools, the Long Beach and Fullerton Chapters of Phi Delta Kappa of California State University, our U.S. Education Department Region IX office and the National Diffusion Network in this conference. Your attendance at this conference is indicative of your concern for the important issue.

During a time period when we have had a U.S. President put education high on the national agenda for the first time in a quarter of a century, when we have had a U.S. Secretary of Education take a leadership role focusing on improving the quality of education, and when we have the National Commission on Excellence in Education and numerous other commissions and reports documenting American education's slide from excellence to mediocrity, it is refreshing and encouraging to witness a gathering such as this one--educators committed to excellence and the use of technology to achieve that excellence. The challenge we in education face is not a new one but it has such widespread significance that none of us can foresee the vast consequences on our educational system, on our nation's economy and on the international scene from this change we term the "computer revolution."

However, we should not view this change as an idealistic utopia which will solve century-old problems of contact and communication nor view it with a type of frenzied apathy where little opportunity is made to make the best use of new and innovative conveyers of information.

A recent cartoon pictured a young office worker seated at his desk looking up at a sign on the wall stating "Remember, you can be replaced by a silicon chip."

While this appears a rather drastic warning for someone in industry or information services, we in education cannot ignore the significance of this message.

Dr. Diane Ravitch, a faculty member at Teachers College at Columbia University, points out to all of us in her recent book The Troubled Crusade, a history of American education from 1945 through 1980, of the serious consequences--the disastrous consequences--of embracing every new fad in education without relating it to academic substance or intellectual betterment of students.

We who are involved in instructional technology need to be especially aware of the harm of using computers just because they are available or turning classrooms into one huge video arcade.

The use of instructional technology must be related to enhancing student learning, improving teacher productivity, and creating more effective schools. Anything less than these objectives will allow our critics to justifiably bring further scorn and criticism on the education profession. We must be willing to choose the difficult path

of raising our schools to a common mission of academic achievement and to avoid making those non-academic tasks, sometimes unwisely and arbitrarily assigned to the schools in the 1960s and 1970s, a primary goal.

As you recall, we were told that missions of equity, social promotion, nutrition, values clarification, expanded student choice and an endless list of humane objectives could be added to the school curriculum to coexist with academic subjects. That combination did not work and we know now, to our regret and chagrin, that the non-academic mission of the schools crowded out the academic mission. It is time for us to regroup and hold high the torch of academic achievement as the foremost task of our schools. For in the race for excellence and productivity, there is not much consolation or hope for those nations which put in second place the goal of educating their students to their full intellectual capacity. The race for academic excellence is a race a nation can lose by defeat as well as by default.

We witness the "information age" all around us--young people gathered in video arcades, instant communication of events around the world by satellite, the exchange of information or financial transactions from across town or across the oceans by one computer talking to another computer.

The prophets and the promoters and the analysts are hard at work trying to predict what we will have in a future society. The pace of change in information technology is both rapid and unexpected. Alvin Toffler focused on the electronic cottage in The Third Wave; John Naisbitt emphasized the new directions sophisticated technology is

taking us in his work Megatrends; and Ron Gordon, the inventor of the hand-held calculator and the pocket language translator, describes the concept of an "electronic university," a school system without a finite campus expanded to cover the entire globe where a student can be located anywhere, studying virtually anything, at any hour taught by private instructors located throughout the world offering courses in his or her precise expertise. In their special report on the future (May 9, 1983), U.S. News and World Report noted: "Use of television, computers and videotapes will also create classrooms in libraries, museums, neighborhood centers and the home."

During the 1950s the American people, concerned over Sputnik, sought to overtake the Soviet Union in education; during the 1980s, the American people see the Japanese as the challenge. Whether the challenger for U.S. economic supremacy is an adversary or ally on the international horizon, the challenge and contest is just as intense--and as serious.

Let us just take a moment and to use our imaginations on the great challenges we face. Let us jump ahead beyond the school use of computer to the computer we may find prevalent in society in a decade or two. Work is progressing on cognitive science and artificial intelligence. I am asking you to focus for just a moment on what is known as the fifth generation--a breed of supercomputers so fast that they can surpass today's machines a thousand times over and so smart they can out think humans. This is not science fiction nor another Japanese scare story warns authors Edward Feigenbaum and Pamela McCorduck in their recent book The Fifth Generation: Artificial Intelligence and Japan's Computer

Challenge to the World. Japan has predicted that it will be marketing such machines within a decade and have mounted an effort similar to the U.S. space effort. Authors Feigenbaum and McCorduck note:

> The Japanese expected these new computers, which users will be able to speak with in everyday conversational language, or show pictures to, or transmit messages to by keyboard or handwriting, to penetrate every level of society. They will assume no special expertise or knowledge of arcane programming languages. They will not even require the user to be specific about his needs, because they will have reasoning power and will be able to tease out from the user, by questioning and by suggestions, just exactly what it is that the user wants to do or know. Finally, these new machines will be inexpensive and reliable enough to be used everywhere, in offices, factories, restaurants, shops, farms, and fisheries, and of course, homes. (p. 8)

Is it any wonder that President Reagan, notably in his Seton Hall University speech termed this Information Age as the beginning of another revolution ranging from tiny microchips to voyages into the infinity of space?

All of you are playing and will play a critical role in the adoption of this technology in education. The technology revolution is a grassroots movement in which we must all play a part.

I would like to focus on some of the perceptions we have on the technology revolution in the U.S. Education Department.

On June 22, 1982, U.S. Secretary of Education, Terrel Bell, at a National Teleconference on Educational Technology, announced a technology initiative for the U.S. Education Department. In explaining the initiative, Secretary Bell said:

> The growing computer industry has been a major cause of the increased demand for individuals with basic and higher level skills, particularly in the related fields of math and science. We should assist school districts to explore uses of technology to improve skill instruction, to prepare for employment, and to increase the productivity of teaching.

Because the lead office in implementing this initiative is the Office of Educational Research and Improvement, I have been fortunate to have been involved with and witnessed much of the drama in the field of educational technology which has taken place since that time. Although much has happened since that June day in 1982 when Secretary Bell made his announcement, it is still only a beginning.

There is no doubt that the computer, and its related technologies, is here, and here to stay. What that means, however, in terms of our society, and for schools and educators, is yet to be determined. You, here today, can be a part of the answer.

There are still some who view the world of the computer with apprehension, perhaps even disdain. Some feel that if we ignore this new machine it will go away, and so much the better. Such an attitude is born of an unwillingness to examine the very positive effect that the computer can have on every aspect of our society--education, home-life, work, leisure, almost anything you can name.

Realistically, the computer is a fact of our times. As an event, future generations of historians will view its advent as perhaps as great if not greater than the machine age which indeed changed the course of history. Contemporaries who lived during the Agricultural Revolution or the Invention of Printing or the Industrial Age were not able to foresee the great changes these respective movements brought about in society. One can recall even among the forecasters of our own age H.G. Wells did not foresee travel to the moon until sometime after the year 2000 and Aldous Huxley never mentioned the possibility of atomic power in his classic Brave New World.

In looking at the phenomenon, I am reminded of a swimmer about to enter icy waters. First a toe goes in, then it is removed. The swimmer may move a few feet along the shore and then try the toe again. Next, the legs go in and slowly the swimmer begins to submerge himself in the water. The full pleasure of the swim, however, does not come until the plunge has been made and the swimmer has become completely immersed in the water.

So it is in many cases with the move by educators into the technological world. Those who remain on the periphery, choosing to only wet their toes, are denying themselves the opportunity which the new technological advancements can offer.

On the other hand, there are those who would like to make the plunge but need guidance and direction in doing so. Let us take a look now at some of their problems and perspectives: What do educators face as they confront this new world of technology?

Interest by local school districts in this area is evidenced in the rapid increase in the acquisition of personal microcomputers. According to the National Center for Education Statistics, in the Fall of 1980 there were 31,000 microcomputers in the schools--that number grew to 96,000 by Spring of 1982. It is expected that by the end of 1983 there will be close to 300,000 in the schools. A report from John Hopkins University indicates that more than half the nation's schools have at least one microcomputer.

Many local and state education agencies are showing their interest by holding meetings and conferences to explore the uses of technology for their schools, and to explore such questions as: How can it be used

in the classroom? How can it be adapted to aid the teacher in the performance of some of the more routine chores? Can it improve the administration of the schools?

I have been fortunate to have attended several such gatherings and I have been impressed with the degree of interest and expertise that many teachers and administrators already have. The best ideas are coming from the State and local level. Here is where one can find real creativity at work.

At the university and college level there is increasing interest and use of computers. There are institutions of higher learning that now require every student to have access to their own microcomputer either through personal ownership by the student or through some type of lending program by the college or university. Carnegie-Mellon University expects that almost everyone of their students will be working on a computer by 1986 covering the fields not only of math and engineering but music, drama, history, and writing.

The National Commission on Excellence in Education in its report, A Nation at Risk: The Imperative for Educational Reform strongly recommended that state and local high school graduation requirements include a half-year of computer science. The Commission report made this perceptive observation:

> The teaching of computer science in high school should equip graduates to: (a) understand the computer as an information, computation, and communication device; (b) use the computer in the study of the other Basics and for personal and work-related purposes; and (c) understand the world of computers, electronics, and related technologies.

There is a growing interest in the United States Congress exploring the role of technology. During September the Subcommittee on Investigations and Oversight of the House Committee on Science and Technology of the U.S. House of Representatives held hearings on the subject of computers and education. The purpose of the hearings was to examine ways to maximize the benefits of computers in our educational system.

There is activity at all levels of government--local, state and federal--within their respective spheres of influence. There is much involvement in explorations of what the computer can do in the field of education. Under the block grant program of the Reagan Administration in which almost thirty federal programs and their resources were turned over to State and local decision-makers, it has been encouraging to find State and local educators have used this block grant money to meet their individual needs for computer hardware and software in education.

Importantly, the recognition of the significance and importance that the computer can and will play in the field of education is pretty widespread. It is, after all, in the educational arena that the true potential of the computer will be realized. It is, as well, the generation of students now in school who will benefit from the computer just as it is they who will lose out if we fail to realize the potential that the computer can have as an educational tool.

In order to better focus on that potential, the Office of Educational Research and Improvement in November of 1982 convened a Research Conference in Pittsburgh, Pennsylvania. The conference

participants were asked to examine the future of computers in education as well as examining what research is needed in order to realize the potential of the computer.

A number of education related occupations were represented among the forty experts invited to participate. These included: scientists, psychologists, educational researchers, teachers, and school administrators. A two volume work entitled Computers in Education: Realizing the Potential resulted from that conference. In the Chairmen's report, computers are acknowledged as "tools of education"--- for both students and teachers. The report states:

> ...Computers can be powerful intellectual tools. They can perform arithmetic calculations and are becoming able to manipulate equations; they can facilitate the writing process and expedite formatting and revision; they can retrieve information from large data bases. These capabilities can be used to shift educational emphasis from the teaching of routine skills to the teaching of the more sophisticated thinking skills needed in our technological society. They can also be used to improve learning in non-technology areas.

There has been growing concern recently throughout the nation, about the poor showing of students in the basics. Standardized scores verify that colleges and employers concerns regarding students poor performance in reading, writing, mathematics, and science is indeed a fact. Performance in these areas has been on the decline for the past two decades. With proper application there is no reason why computers can not serve as a tool to improve teaching and learning in these very important areas. Interest is being focused on the Hempstead model. The Hempstead School district in New York state, serving largely a

disadvantaged student group, has demonstrated that microcomputer aided preparation can be an effective and relatively inexpensive way of helping students raise their SAT scores.

In a report prepared for the Office of Educational Research and Improvement under a contract, Robert Tinker, Director of Technical Education Research Centers, Inc., observes:

> The graphics, animation, interaction, speed, and "patience," and non-judgemental character of microcomputers can be used with great effectiveness.

This "effectiveness", combined with the appropriate software, could be a powerful tool employed to improve student performance in the basics. Mr. Tinker's work was directly related to software in the areas of science and mathematics but his suggestions for usage could apply to the other basics as well. He suggests:

- Using the computer for testing, drill and practice, and games is popular and effective, especially for remediation.
- Well designed interactive tutorials could become an important source of instruction.
- Although the use of microcomputers to manage instruction (CMI) is uncommon, many of those who use it are enthusiastic about its impact.

The key to using computers as tools to improve instruction in the basics is the development of good, appropriate software which is compatible with a large number of machines. Software, no matter how effective it is in its presentation, will do no good if it can only be used on a limited number of machines. Secretary Bell highlighted this problem in his testimony before the House Subcommittee on Investigations and Oversight of the House Committee on Science and Technology.

There is also great potential for the computer as a supplemental learning tool. For example, Scholastic, a company known for their classroom magazines, has recently offered students a subscription to a bimonthly Microzine--an interactive magazine on a computer disk. Designed for students in grades 4 to 6 each issue will consist of 4 full length programs.

I would now like to take a few minutes to focus on some other specific programs of the Office of Educational Research and Improvement which are quite exciting and in which I think that you, as educators, would be interested.

We have a number of programs under our Center for Libraries and Education Improvement.

We have ten lighthouse schools identified through the National Diffusion Network as outstanding examples of the use of technology. One is the MATH/TECH program for seventh through twelfth grade classroom application located here in California.

We have several contracts utilizing technology to improve the teaching of basic skills in math, science and writing. In the latter case we have Project Quill which uses a set of microcomputer-based programs around which several instructional activities have been developed. These activities are geared to young writers in grades 3 to 6. Quill utilizes the microcomputer's technological capabilities to help teachers teach writing. Utilizing the youngster's natural enthusiasm for anything connected with the computer, there is strong motivation for them to write and to perform the various tasks which are

a part of the program. This approach offers the challenge of eliminating the drudgery of rewriting compositions by hand while encouraging creativity. Corrections and rewrites can be made quickly on the word processor and a print-out secured.

We plan to announce a series of school-based technology demonstration sites in which schools identify a learning objective among the fields of science, math, reading, and writing and seek to accomplish this objective by using one or more of the new technologies.

We are also using technology, educational television, to teach science through such programs as the "Voyage of the Mimi" and, in cooperation with the National Science Foundation, "3-2-1 Contact".

Our National Center for Education Statistics has completed surveys showing the growing use of computers in the schools, and has a panel examining the definitions of computer literacy. Through surveys and analysis, the Center is seeking to record the impact of technology on our school system from elementary through postsecondary levels.

The National Institute of Education is pursuing a number of research projects focusing on how computers and technology can assist the learning process. A grant was given most recently to Harvard University to establish a Center for Technology, focusing on key issues in education and technology.

The technology revolution is not in the future; it is here and now.

The crisis in American education is not something in the past but it is here and now and we must take steps to remedy this crisis.

Author Benjamin J. Stein ruffled a few feathers recently in stating that as a result of a two year survey he found an "astounding level of ignorance of the Southern California teenager". While we may question his survey method and debate whether the Southern California teenager is more or less ignorant than in other parts of this vast country, two issues are illustrated by this survey. One, education is in a crisis and this has been confirmed by numerous studies and reports including the National Commission on Excellence in Education report. The second issue is one that Mr. Stein made in his column and James Jackson Kilpatrick made in a subsequent column--commenting on Mr. Stein's observations: students who do not understand the basic history of the U.S. and differences between free societies and totalitarian societies may not be prepared for the most basic national responsibility, namely understanding what the society is about and why it must be preserved.

We have an obligation to educate American students to the best of their academic ability. President Reagan has noted that while the role of the federal government is limited in the area of education, nevertheless, there is much the federal government can do to

> help set a national agenda for excellence in education, a commitment to quality that can open new opportunities and new horizons for young people.

We must educate a generation of Americans with the understanding and skills to fully participate in the technological world in which they must function.

We Americans have a bright and optimistic future, and we cheat our youth if we paint a picture of the future which is grim and despairing.

We have had too much emphasis on the negatives--energy resources drying up, pollution of the environment, and burdens of the "have not" nations supposedly imposed by the "have" nations. Dr. Herman Kahn, who died suddenly earlier this year, noted that even more significant that what our children are being taught is what they are not being taught. The lessons unlearned in our classrooms are that the wealthy nations play a constructive and essential role in furthering world economics, that rapid economic growth has changed many non-Western nations from poor to middle-income status, and that most resources are more accessible and less costly today than every before. In addition, he noted that all these forms of progress are likely to proceed even more effectively in the future.

In his last great work, The Coming Boom, Dr. Kahn reminded us that high technology promises to bring back

> a sense of excitement, achievement, and progress which even astronauts and outer space no longer elicit.

California, the largest state in our union, has set the pace and development for change. Your work and participation today can have great repercussions as we all work to harness the power of the computer to the wagon of excellence and quality in education.